MAGNETICALLY COUPLED TIRE PRESSURE SENSING SYSTEM

Abstract:

A tire pressure reporting and warning system employs low-cost passive magnetically coupled pressure senders within the tires. These senders employ permanent magnets that rotate in response to pressure and may conveniently be mounted on the valve stem. A sender comprises a high-permeability helical ribbon that translates in response to pressure and penetrates a magnetic circuit. The magnetic circuit rotates into alignment with the helical ribbon. A novel feature of this invention is the dual-purpose use of the magnet both as a means for producing rotation in response to pressure and simultaneously for producing the remotely sensed external magnetic field. The direction and strength of the external field depends both on the rotation of the magnet with respect to the tire and on the overall orbital motion as the tire rotates. Remote pressure readers at each wheel respond to the magnetic field components and interpret the response asymmetry in terms of tire pressure by continuously calculating response skew as the tires rotate. Analyzing skew obviates the need for tire rotation sensing and timing and eliminates magnetic strength effects. No special alignment is required between senders and readers, so the readers may be mounted rather arbitrarily nearby the vehicle wheels.